1 – (12 points) An annuity consists of 20 annual payments of $1,000 starting at t=11 and ending at t=30 inclusive. If i=8%, find the value of this annuity at each of the following times:

 a) t=11

 b) t=0

 c) t=40

2 – (10 points) Annual payments of 4500 are made starting at the end of 1990 and ending at the end of 2005. Find the total value of these payments at the end of 2000 if the annual effective interest rate is 10%.

3 – (10 points) Answer the following:

 a) Prove that am+n=am+vman

b) If a4=3.2397, a11=6.9052, and a15=8.0607, find i.

4 – (12 points) Deposits of $1000 are placed in a fund at the beginning of each year for 20 years. The fund is being accumulated in order to be able to withdraw a certain amount every year forever. If the first withdrawal takes place at the end of the 30th year, and if i=10%, find the amount of each withdrawal.

5 – (14 points) A benefactor leaves an inheritance to two charities A and B. The total inheritance is a series of level payments at the end of each year forever. Charity A receives the first 10 payments and charity B receives all payments thereafter. The present value of the shares of A and B are equal.

 a) (9 points) Find the annual effective rate of interest, i.

b) (5 points) Charity A decides to give family X the first 5 of the 10 payments and to give family Y the next 5 payments. Find the ratio of the present value of X’s share to the present value of Y’s share.

6 – (18 points) A pension fund is accumulated by means of payments at the end of every six months for a period of 15 years. The payments are $100 each during the first 5 years, $200 each during the second 5 years, and $300 each during the last 5 years. Starting in the 16th year, the fund is used to make withdrawals of $400 at the end of every six months for as long as possible. The nominal interest rate throughout is at 4% compounded semi-annually. Find the time and amount of the final withdrawal if this is to be larger than the regular withdrawal (balloon payment).

7 – (10 points) John deposits $1,000 in his bank account at the end of every quarter for 10 years. The nominal interest rate is 16% convertible quarterly during the first three years and 8 % convertible quarterly thereafter. Find the total amount available to John in his account at the end of 10 years.

8 – (14 points) Sam leaves an inheritance to his two children, Diana and Mark. Diana will receive an annuity-immediate, which pays $10,000 every year for 10 years. Mark will receive an annuity-due which pays $2,400 every quarter for 10 years. If the nominal rate of interest is 6% compounded semi-annually, find whom of the children receives a bigger share of the inheritance.